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the enzyme action of the eggs by virtue of the presence of the enzymes of the spermatozoa. If such were the case the accelerated enzyme action might be demonstrated in the test-tube.

The results of the tests were in no measure conclusive, and the writer had hoped that he would have an opportunity to pursue the problem further, and for these reasons no reports on the investigation were made. As it seems that the work in which the writer is now engaged will prevent his having opportunity to repeat the experiments, a succinct general report of the work will here be made.

Star fish were chosen because they afforded a plentiful supply of both eggs and sperm, and because they were easily obtained from the waters about Woods Hole. The males and females were carefully washed and kept separate. The eggs and sperm were thoroughly ground by mortar and pestle; the power of each to split starch, fat and hydrogen dioxide was tested. Three tubes were used in each case. In tube 1 was placed 5 c.c. of ground eggs, 5 c.c. of starch solution and 5 c.c. of water. In tube 2 was placed 5 c.c. of ground sperm, 5 c.c. of starch solution and 5 c.c. of sea water. In tube 3 was placed 5 c.c. of the ground eggs, 5 c.c. of the ground sperm and 5 c.c. of the starch solution. The tubes were allowed to stand at room temperature for a considerable time, after which the contents were tested for sugar by the reduction test. It was found that there was only the slightest trace of reducing substance in tubes 1 and 2, whereas in tube 3 there was a very distinct amount present. These experiments were repeated perhaps six to ten times and the results were conflicting. They were neither consistently negative nor consistently positive. Nor were they sufficiently often positive to convince one that when they were positive it was not an accident. Comparable experiments to the above were carried out with butyric ether and hydrogen dioxide. The results were equally exasperating as those with starch. Whether the positive results were entirely the result of error or whether the negative results were due to the use of unmaturing eggs or sperm it is impossible to say. It seems, however, that the results were such as to justify a

careful repetition of the experiments, and it is hoped that some capable man who is interested in the problem will take it up.

It is a well-recognized fact that a large number of the female star fish contain a large number of eggs that appear in every way normal, mature and ready for fertilization and yet will not develop when sperm is placed with them. It seems that it may be possible that this would account for the varying results.

ORVILLE HARRY BROWN

NOTE ON THE ACCESSORY CLEAVAGE IN THE  
HEN'S EGG<sup>1</sup>

HARPER<sup>2</sup> has shown that polyspermy normally occurs in the pigeon's egg. His figures indicate that from twelve to twenty-five sperm-nuclei are formed in the egg. Only one of these, however, becomes a functional sperm-nucleus; the others migrate from the points of entrance to the periphery of the disc where they become active, dividing and giving rise to the "accessory cleavage." There is thus formed around the primary cleavage, which is produced by the divisions of the segmentation nucleus, an area of small cells. Blount<sup>3</sup> has later shown that these supernumerary sperm-nuclei live but for a short time, and then degenerate. She estimates the time of their disappearance as coming between ten and twelve hours after fertilization.

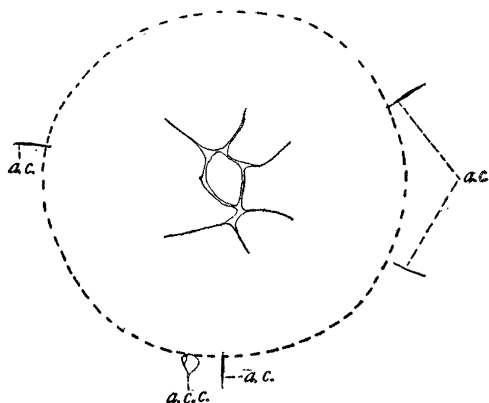
In the hen's egg accessory cleavage has neither been figured nor described. On taking up the study of the early development of this egg I was, therefore, greatly surprised to find an accessory cleavage. Not only can the furrows be seen in the living egg, but I also have preparations of surface views in which they stand out with diagrammatic clearness.

<sup>1</sup>Publications from the Zoological Laboratory of the University of Texas, No. 96. The writer is greatly indebted to the trustees of the Elizabeth Thompson Science Fund for a grant with which to carry on this work.

<sup>2</sup>E. H. Harper, "The Fertilization and Early Development of the Pigeon's Egg," *Amer. Jour. of Anat.*, Vol. III., No. 4.

<sup>3</sup>Mary Blount, "The Early Development of the Pigeon's Egg, with Especial Reference to the Supernumerary Sperm Nuclei, the Periblast and the Germ Wall," *Biol. Bull.*, Vol. XIII., No. 5.

The earliest stage at which I have observed the accessory cleavage is the four-cell. It takes place outside of the area occupied by the primary cleavage, and the planes of the furrows usually coincide with radii of the disc.



Eight-cell stage of the hen's egg. The egg was taken about twenty hours before the time of laying. *a. c.*, accessory cleavage furrows; *a. c. c.*, a small accessory cleavage cell. The dotted line represents the limit of the area of primary cleavage.

The number of accessory cleavages is at no time great. The greatest number so far observed is shown in the accompanying sketch. The actual number, however, may be slightly greater than is indicated by surface views, because in the sections of at least one egg, I have found that not all of the cleavages come to the surface, but some occur in a horizontal plane. That these cleavages are accessory is evidenced by the fact that their accompanying nuclei greatly simulate the supernumerary sperm-nuclei figured by Harper for the pigeon.

Shortly after the stage figured above the accessory cleavages disappear. A detailed study of sections will have to determine whether their disappearance is to be correlated with the degeneration of the supernumerary sperm-nuclei, as reported for the pigeon.

In conclusion it may be said that polyspermy, accompanied by accessory cleavage, normally occurs in the hen's egg. If the number of accessory cleavage furrows may be taken as a general index to the number of accessory sperms entering the egg, it is evident

that polyspermy in the hen is not nearly so great as in the pigeon.

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#### THE AMERICAN PHILOSOPHICAL SOCIETY

THE general meeting of the American Philosophical Society was held at the hall of the society on Independence Square, Philadelphia, on April 22, 23 and 24. The opening session began at two o'clock on Thursday, April 22, with President Keen in the chair, and morning and afternoon sessions were held on Friday and Saturday. Vice-president Michelson was in the chair during the session devoted to the papers in physics and Vice-president Scott at that at which the geological papers were considered. The evening of Friday, April 23, was devoted to a Darwin celebration commemorative of the centenary of Charles Darwin's birth and of the fiftieth anniversary of the publication of the "*Origin of Species*," at which addresses made by the Right Honorable James Bryce, the British Ambassador, on "*Personal Reminiscences of Charles Darwin and of the Reception of the 'Origin of Species'*"; by Professor George Lincoln Goodale, of Harvard, on "*The Influence of Darwin on Natural Science*," and by Professor George Stuart Fullerton, of Columbia, on "*The Influence of Darwin on the Mental and Moral Sciences*."

On Saturday afternoon there was a symposium on earthquakes at which papers were presented by Professor Edmund O. Hovey, Professor William H. Hobbs and by Professor Harry F. Reid. Aside from the three papers presented at the Darwin celebration on Friday evening, forty-four papers were read at the morning and afternoon sessions. A list of these papers with a brief summary of their contents follows:

*The American-British Atlantic Fisheries Question*: THOMAS WILLING BALCH, of Philadelphia.

This controversy, which is more than a century old, will shortly be submitted to The Hague International Court for settlement. As in the case of the Alaska frontier, where Canada's land claims grew greater with the passing of years, so in this fisheries dispute the position of America on the one hand and of Great Britain, Canada and Newfoundland on the other, is admirably summed up in the words with which the Russian plenipotentiary, Count Nesselrode, defined the positions and arguments of Russia and England when they were discussing the Russo-British American frontier: "Thus we wish to conserve and the English companies wish to acquire."